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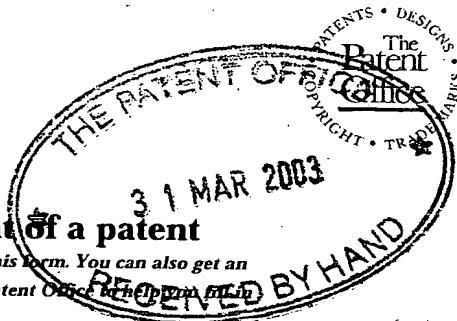
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Dated 7 April 2004

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PAU/7700 0.60-0307422.6

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

 Cardiff Road
 Newport
 South Wales
 NP10 8QQ

1. Your reference

MJS/NP6064976

2. Patent application number

(The Patent Office will fill in this part)

31 MAR 2003

0307422.6

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)
 WALKER FILTRATION LTD
 SPIRE ROAD, GLOVER EAST,
 WASHINGTON
 TYNE & WEAR
 NE37 3ES, GB
Patents ADP number (*if you know it*)

8143 89 003

GB

4. Title of the invention

ELECTRONIC CONTROL DEVICE FOR GAS DRYER

5. Name of your agent (*if you have one*)
 MEWBURN ELLIS
 York House
 23 Kingsway
 London WC2B 6HP

 "Address for service" in the United Kingdom
 to which all correspondence should be sent
 (*including the postcode*)
Patents ADP number (*if you know it*)

109006

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number
(*if you know it*)Date of filing
(*day / month / year*)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(*day / month / year*)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

See note (d))

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form.
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Continuation sheets of this form

Description

9

Claim(s)

Abstract

Drawing(s)

2 + 2

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination
(*Patents Form 10/77*)

Any other documents
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature



Date

28 March 2003

12. Name and daytime telephone number of person to contact in the United Kingdom

Michael John SANDERSON

0191 232 8685

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ELECTRONIC CONTROL DEVICE FOR GAS DRYER

This invention relates to an electronic control device for a gas dryer, and has particular though not exclusive 5 application to such devices for controlling a twin tower regenerative gas dryer.

Gas dryers are conventionally each provided with their own electronic controllers which are specifically designed to carry out different functions associated with the 10 particular dryer.

These controllers serve to operate the dryer, and are not readily adaptable to provide input and output facilities to other than the basic control functions of the associated dryer.

15 It would be desirable to be able to provide a compact, relatively adaptable electronic control device which can be used with any one of a plurality of different dryers.

According to the present invention, there is provided an electronic device for controlling gas flow in a gas 20 dryer, the device comprising a housing in which is mounted an electronic control circuit, and at least two electrically operated valves for controlling functions of the dryer provided with plugs or sockets and adapted to co-operate with corresponding sockets or plugs in a wall of 25 the housing electrically connected to the electronic

circuit whereby the valves are mounted on, externally of, the housing and are electrically connected to the control circuit.

Such a device is extremely compact, eliminates the 5 requirement for additional wiring between the valves and the control circuit, and is particularly useful for controlling the operation of a pressure swing twin tower regenerative gas drier, at least one of the valves being associated with control of the flow of gas in each of the 10 towers.

Conveniently the valves are each solenoid valves, while it is preferred that the valves are each secured in an operative position on the housing, for example by a bolt.

15 In one embodiment of the invention, each valve is provided with DIN spade connectors thereon for location in corresponding sockets in the housing and for plugging into female DIN connectors on the electronic control circuit, which circuit is conveniently a circuit board.

20 Preferably at least part of the housing is transparent, and may include a body portion and a lid which is a sealing fit thereon.

A preferred device incorporates three valves, one for controlling the exhaust of each of the towers (whereby one 25 tower is at pressure while the other tower is at

atmospheric pressure), and the third valve controlling the drainage of liquid from the gas input to the dryer.

The device may have a single universal AC/DC power supply inlet or a dual AC/DC power supply inlet by means of 5 two adjacent DIN type plug connections or by other means known in the art.

The preferred material for the housing is injection moulded plastic which can be designed and moulded to locate the valve DIN connections in specific locations to suit the 10 dryer design. Whereas a plastic lid is the preferred option, a metal lid can be used which also acts as a heat sink to control the internal temperature of the electronic components.

When using LEDs to provide information relative to 15 operation of the device, it is particularly advantageous to use a clear plastic lid which allows the LED illumination or LCD displays to be seen without compromising the IP rating of the housing or exposing the components to physical damage. The IP rating of the housing can be 20 enhanced by using an 'O'ring, or similar seal, between the housing parts (the IP rating indicates the integrity of the insulation of the housing - i.e. the level of sealing to dust). Typically the housings will have IP ratings of IP65, but all other IP ratings are possible.

As previously mentioned, a third solenoid valve may be fixed to the device to provide a filter drain means which opens and closes in a pre-programmed time sequence, and whereby the filter bowls through which the moist input gas 5 is fed to the dryer are regularly emptied without the requirement for any electronic components at/on the bowls.

A further DIN connector can be attached to the device providing a two wire, volt free contact which changes state if the device detects a circuit fault or a fault in the 10 solenoid operation. This fault condition can trigger an audible alarm, visual alarm, control room alarm or a combination of methods.

A still further DIN connector, or the aforementioned further connector with a four core cable, can be used for 15 operating the dryer in conjunction with the loading of the compressor such that, when the compressor goes 'off load', the dryer effectively stops the purge cycle immediately or after a predetermined time delay, and, when the compressor comes 'on load', the dryer starts up again. When operating 20 in conjunction with a compressor, the device can have an infinite electronic memory which will re-start the dryer on the same tower as it stopped.

The device can be programmed and run using normal electronic components, but the preferred option is by means 25 of micro-controllers, the use of such micro-controllers

offering a much more powerful, low cost solution at an affordable price. The timing sequence of all valves and output signals are controlled by pre-programmed software.

The device can have an RS232, RS485 or like interface

5. for connection to such as data logging devices, PC's and palm top computers. This feature enables the electronic control device to be connected individually or via an external computer network (with other control devices also connected) to a local or remote computer where the dryer 10 parameters and potential electrical fault conditions can be monitored or changed, or the control software modified or upgraded.

Operating hours, electrical faults and operating parameters can be stored in the control device memory for 15 future examination using the RS232 or RS485 interface.

Additional electrical inputs indicating other operating parameters such as temperature, pressure, dew-point, humidity or rate of flow can be fed into the control device for recording purposes or for automatic adjustment 20 and control of the dryer cycle time and purge airflow rate.

The RS232 or RS485 interface can be used to provide a connection with other tele-communications devices, such as data logging, e-mail messages, text messages to mobile phones, and fault alarms to remote control room 25 installations, and to output text information to LCD

displays which can be incorporated into the housing or exported to external displays.

The device can have LED (or similar) components which illuminate when electrical power is reaching the device.

5 This is normally known as 'Power on' mode. Further LED's can indicate which dryer tower is 'on-line' during operation.

The device can have further LED components to indicate service or maintenance intervals, such as desiccant change 10 typically every 12,000 hours. Such LED's can be made to change colour and/or flash in a particular manner to indicate specific conditions. The device can also have a re-set switch method which can be used to re-set the device for the next timing period e.g. typically 12,000 hours.

15 The device can have further LED components to indicate when particular electrical faults occur, such as open or short circuit in critical components such as solenoid valves or control electronics. LED's can be made to change colour and/or flash in a particular manner to indicate 20 specific conditions.

The device can be configured to accept any voltage between 240 and 50 V.AC, 50 or 60 Hz and 48 to 12 V.DC for true 'plug-in and run' anywhere in the world.

Whilst the device can have many input voltages, the 25 preferred electrical outputs to operate the solenoid valves

are low voltage for all applications, resulting in a higher degree of electrical safety (e.g. 12V.DC). This feature allows the standardisation of dryer operating valves, irrespective of the inlet supply voltage.

5 Conventional dryers have to use valves corresponding to the inlet supply voltage, which therefore involves a much higher inventory of valve parts.

While the above refers to two solenoid valve operation, the control device of the invention can be
10 constructed to operate additional solenoid valves, the timing cycles of which are similarly programmable.

Of the accompanying drawings:

Fig. 1 is an isometric view of a housing of a control device according to the invention, and

15 Fig. 2 is an exploded isometric view of a control device according to the invention.

In the drawings:

reference numeral 2 indicates the housing of the device;

20 reference numeral 4 indicates the power-in socket (which may be AC and DC and may be a single universal AC/DC inlet or a dual AC/DC inlet);

reference numeral 6 indicates the power-in DIN plug;

reference numerals 8,10 and 12 indicate three solenoid valves, one for controlling the exhaust of each tower of the dryer, and the third for controlling the filter drain;

reference numeral 14 indicates a DIN plug associated 5 with input signals to the device such as for energy management purposes;

reference numeral 16 indicates a DIN plug associated with output signals from the device such as alarm/fault conditions;

10 reference numeral 18 indicates an RS232 or RS485 input plug;

reference numeral 20 indicates the housing cover provided with transparent LED windows;

reference numerals 22 and 24 indicate tower on/off LED 15 indicators, one for each tower;

reference numeral 26 represents the filter drain on/off LED indicator;

reference numeral 28 represents a power on/fault/cartridge change LED indicator;

20 reference numeral 30 indicates a reset switch, which may be of the contact or non-contact type.

The illustrated electronic control device is a compact, adaptable component capable of controlling numerous selective functions of, for example, a range of

pressure swing turn tower regenerative gas dryers in an economic and effective manner.

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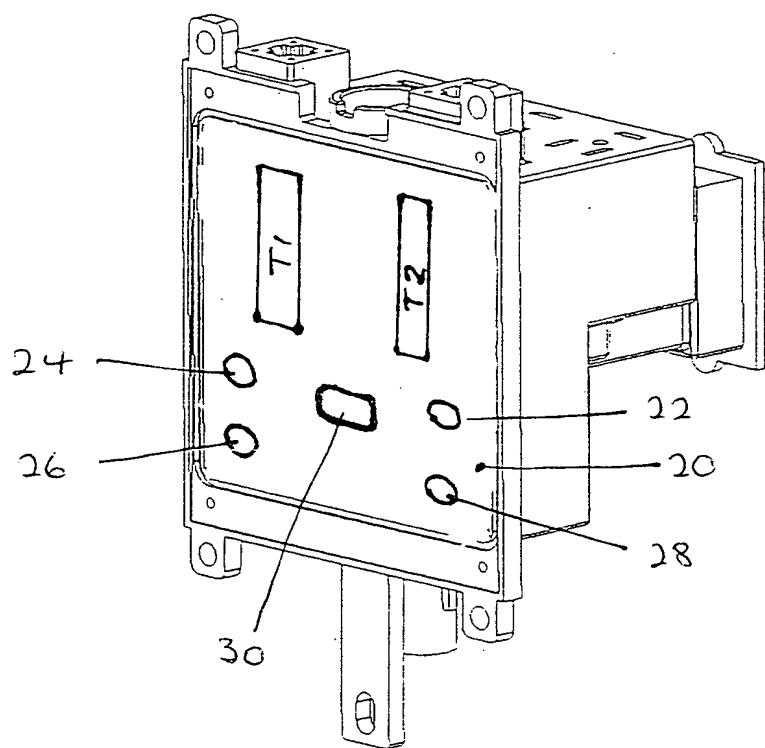


FIG. 1

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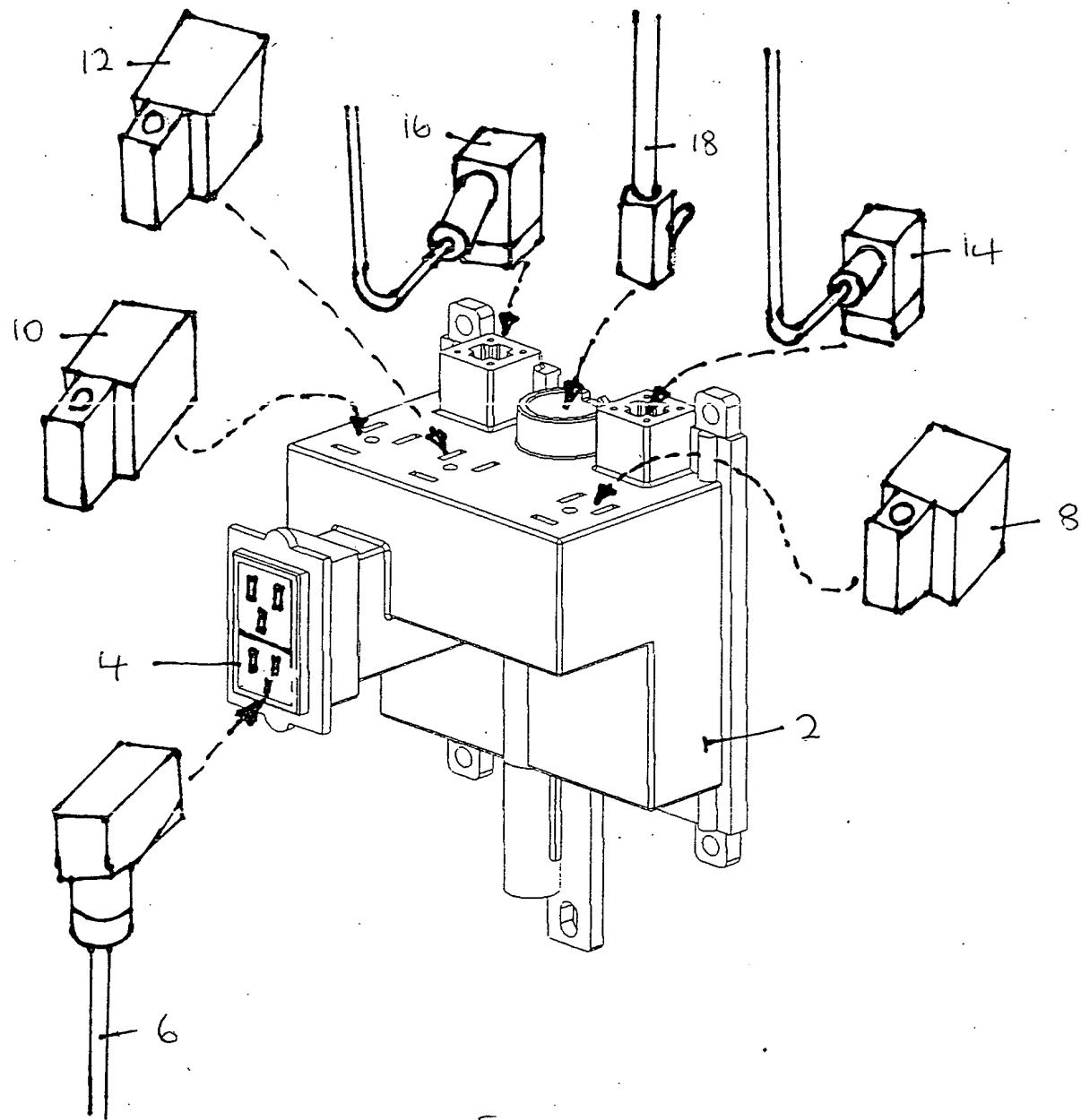


FIG. 2

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